

Configuring Routing Between VLANs with IEEE 802.1Q Encapsulation

This chapter describes the required and optional tasks for configuring routing between VLANs with IEEE 802.1Q encapsulation.

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Restrictions for Configuring Routing Between VLANs with IEEE 802.1Q Encapsulation

Shared port adapters (SPAs) on Cisco ASR 1000 Series Aggregation Services Router have a limit of 8,000 TCAM entries, which limits the number of VLANs you can create on a single SPA.

Information About Configuring Routing Between VLANs with IEEE 802.1Q Encapsulation

Configuring Routing Between VLANs with IEEE 802.1Q Encapsulation

The IEEE 802.1Q protocol is used to interconnect multiple switches and routers, and for defining VLAN topologies. The IEEE 802.1Q standard is extremely restrictive to untagged frames. The standard provides only a per-port VLANs solution for untagged frames. For example, assigning untagged frames to VLANs takes into consideration only the port from which they have been received. Each port has a parameter called

a *permanent virtual identification* (Native VLAN) that specifies the VLAN assigned to receive untagged frames.

The main characteristics of IEEE 802.1Q are as follows:

- Assigns frames to VLANs by filtering.
- The standard assumes the presence of a single spanning tree and of an explicit tagging scheme with one-level tagging.

How to Configure Routing Between VLANs with IEEE 802.1Q Encapsulation

Configuring IP Routing over IEEE 802.1Q

IP routing over IEEE 802.1Q extends IP routing capabilities to include support for routing IP frame types in VLAN configurations using the IEEE 802.1Q encapsulation.

To route IP over IEEE 802.1Q between VLANs, you need to customize the subinterface to create the environment in which it will be used. Perform the tasks described in the following sections in the order in which they appear:

Enabling IP Routing

IP routing is automatically enabled in the Cisco IOS XE software for routers. To reenable IP routing if it has been disabled, perform the following steps.

Once you have IP routing enabled on the router, you can customize the characteristics to suit your environment. If necessary, refer to the IP configuration chapters in the *Cisco IOS XE IP Routing Protocols Configuration Guide* , Release 2, for guidelines on configuring IP.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip routing**
4. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.

	Command or Action	Purpose
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**ip routing** **Example:** `Router(config)# ip routing`	Enables IP routing on the router.
Step 4	**end** **Example:** `Router(config)# exit`	Exits privileged EXEC mode.

Defining the VLAN Encapsulation Format

To define the encapsulation format as IEEE 802.1Q, perform the following steps.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface gigabitethernet** *card* / *spaslot* / *port* **.** *subinterface-number*
4. **encapsulation dot1q** *vlanid*
5. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface gigabitethernet** *card* / *spaslot* / *port* **.** *subinterface-number* **Example:**	Specifies the subinterface on which IEEE 802.1Q will be used, and enters interface configuration mode.

	Command or Action	Purpose
	`Router(config)# interface gigabitethernet 0/0/0.101`	
Step 4	**encapsulation dot1q** *vlanid* **Example:** `Router(config-subif)# encapsulation dot1q 101`	Defines the encapsulation format as IEEE 802.1Q (**dot1q**), and specifies the VLAN identifier
Step 5	**end** **Example:** `Router(config-subif)# end`	Exits subinterface configuration mode.

Assigning an IP Address to Network Interface

An interface can have one primary IP address. To assign a primary IP address and a network mask to a network interface, perform the following steps.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface gigabitethernet** *card* / *spaslot* / *port* **.** *subinterface-number*
4. **ip address** *ip-address mask*
5. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface gigabitethernet** *card* / *spaslot* / *port* **.** *subinterface-number* **Example:** `Router(config)# interface gigabitethernet 0/0/0.101`	Specifies the subinterface on which IEEE 802.1Q will be used, and enters interface configuration mode.

	Command or Action	Purpose
Step 4	**ip address** *ip-address mask* **Example:** `Router(config-subif)# ip address 10.0.0.0 255.0.0.0`	Sets a primary IP address for an interface. • Enter the primary IP address for an interface. **Note** A mask identifies the bits that denote the network number in an IP address. When you use the mask to subnet a network, the mask is then referred to as a subnet mask.
Step 5	**end** **Example:** `Router(config-subif)# end`	Exits subinterface configuration mode.

Monitoring and Maintaining VLAN Subinterfaces

To indicate whether a VLAN is a native VLAN, perform the following steps.

SUMMARY STEPS

1. **enable**
2. **show vlans**
3. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**show vlans** **Example:** `Router# show vlans`	Displays VLAN information.
Step 3	**end** **Example:** `Router# end`	Exits privileged EXEC mode.

Configuration Examples for Configuring Routing Between VLANs with IEEE 802.1Q Encapsulation

Configuring IP Routing over IEEE 802.1Q Example

This configuration example shows IP being routed on VLAN 101:

```
!
ip routing
!
interface gigabitethernet 4/1/1.101
  encapsulation dot1q 101
  ip addr 10.0.0.0 255.0.0.0
!
```

Additional References

Related Documents

Related Topic	Document Title
IP LAN switching commands: complete command syntax, command mode, defaults, usage guidelines, and examples	Cisco IOS LAN Switching Services Command Reference

Standards

Standard	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	--

MIBs

MIB	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFC	Title
No new or modified RFCs are supported by this feature, and support for existing standards has not been modified by this feature.	--

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for Configuring Routing Between VLANs with IEEE 802.1Q Encapsulation

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to https://cfnng.cisco.com/. An account on Cisco.com is not required.

Table 1: Feature Information for Configuring Routing Between VLANs with IEEE 802.1Q Encapsulation

Feature Name	Releases	Feature Information
Configuring Routing Between VLANs with IEEE 802.1Q Encapsulation	Cisco IOS XE Release 2.1	This feature was introduced on the Cisco ASR 1000 Series Aggregation Services Routers.